GROUP D.1

RUDDER AND AILERON TRIM CONTROL AND INDICATORS (CODE R, A, RD AND AD)

(Completely revised)

LIST OF CONTENTS

Introduction

1. This Group contains the description and operation of the rudder and aileron trim control and indicators circuits, together with information on the servicing required to maintain the equipment in an efficient condition. Routeing and theoretical circuit diagrams are also included. For a general description of the aircraft's electrical system, reference should be made to Groups A.1, A.2 and A.3. Detailed information on the standard items of equipment used in the circuit will be found in the Air Publications listed in Table 1.

DESCRIPTION

Rudder and aileron trim control

Actuators

2. The rudder and aileron trim tabs enable adjustments of trim to be made during flight. The rudder trim tab is operated by an actuator situated in the fin structure. This actuator is mechanically linked with the autostabilizer servomotor unit to move the servomotor fore and aft in its cradle, thereby operating the rudder trim tab by changing the datum position of the servomotor. The aileron tab is also operated by an actuator, mounted in the aileron structure, which is linked to the trim tab by an adjustable operating rod. These actuators have permanent magnet field type motors.

Note . . .

As the autostabilizer installation is rendered inoperative, the servomotor has no function other than that of a mechanical link between the rudder trim actuator and tab.

Trim switch unit

3. Trim is controlled by the combined rudder and aileron trim switch unit located

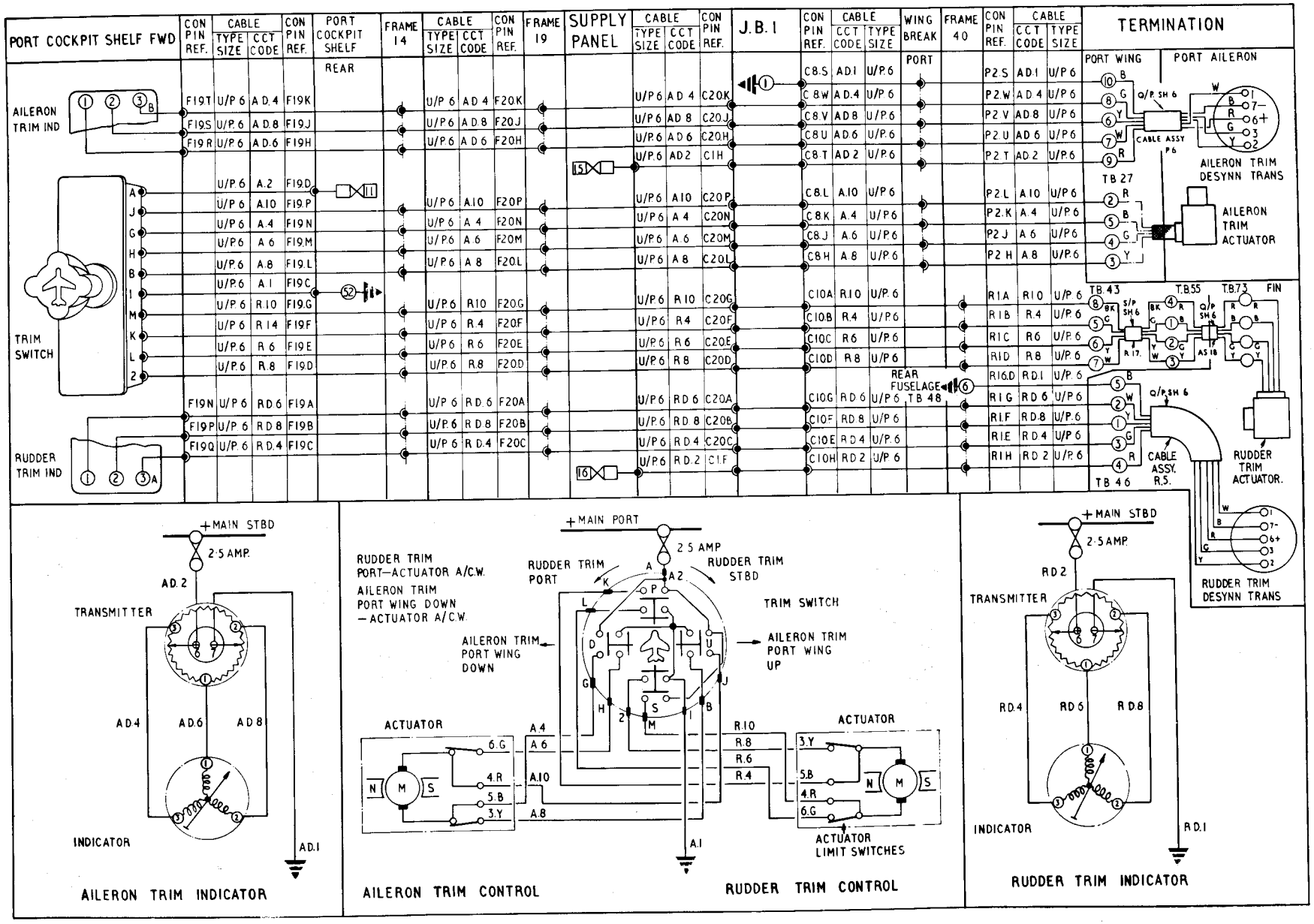

Fig.1 Rudder and aileron trim controls and indicators

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on the forward portion of the cabin port shelf. This control unit contains two double-pole microswitches used to select port wing up or down, and a rotary switch, used to select rudder trim to port or starboard. The switches are operated by a knob projecting from the top of the unit. This knob is moved from side to side for aileron trim and is turned for rudder trim.

4. To facilitate simultaneous trimming in two planes, the knob can be turned and moved sideways at the same time. After the desired trim has been obtained, the knob must be released and allowed to return to its neutral position.

5. When the knob is returned to neutral the actuator is switched off, the tab position being then maintained by the load of the actuator gear train. To prevent inadvertent operation of the aileron tab when using the power controls, a pivoted locking lever, which prevents lateral movement of the trim control knob, can be swung into position around the control knob.

Trim tab position indication

6. The setting of each tab is shown on a combined rudder and aileron tab position indicator which is located just forward of the trim switch and operated by Desynn transmitters. The Desynn transmitter for the rudder tab is bolted to nose rib F in the leading edge of the pin, while that for the aileron tab is located adjacent to the actuator in the aileron nosing. Both transmitters are actuated by Bowden cables connected to levers on their respective actuators.

TABLE 1

Equipment type and Air Publication reference

Equipment type	Air Publication
Rudder trim actuator motor, Type PM.1A	A.P.4343D, Vol.1, Book 4, Sect.20
Aileron trim actuator, Rotax Type C.5021/2	A.P.4343D, Vol.1, Book 5, Sect.16
Trim switch, Mk.8/2	A.P.4343C, Vol.1, Book 1, Sect. 1
Desynn transmitters, Type 470FL (rudder tab), Type 553FL or 568FL (aileron tab)	A.P.1275A, Vol.1, Sect. 1
Desynn indicator, Type 501FL	A.P.1275A, Vol.1, Sect. 1

Operation

Rudder, starboard trim

7. When the trim switch is turned anticlockwise, the two pole rotary switch S *(fig.1)*, is made and current via the fuse passes through one set of the switch contacts to pin M of the trim switch unit. From the trim switch unit, the current is fed to the rudder trim tab actuator.

8. The negative return from the actuator passes through the contacts of a limit switch on the actuator and back to pin 2 of the trim switch unit. At the trim switch the negative return is taken through the other set of contacts of the rotary switch, to pin 1 of the unit and so to earth.

9. When the current is passing in this direction the actuator motor will retract the linkage and so draw the servomotor forward in its cradle. This action moves the trimmer tab to starboard until the actuator is switched off, either by returning the trim switch knob to neutral or, by the opening of the limit switch when the actuator has completed its pre-set travel.

Rudder, port trim

10. When the trim switch knob is turned clockwise, the two pole rotary switch P is made and current is fed through one set of the switch contacts to pin K of the trim switch unit. The current now passes to the rudder trim tab actuator in the opposite direction to that described in para.7, 8 and 9; the negative return passing back to the

trim switch at pin L, through the other contacts of the rotary switch, to pin 1 of the unit and so to earth as before.

11. The actuator motor will now rotate in such a direction as to extend the linkage and drive the servomotor aft in its cradle. This moves the tab to port, until switched off, either by returning the knob to the neutral position or, by the limit switch being opened when the actuator has completed its pre-set travel.

Aileron trim

12. When the trim switch knob is moved from neutral to either side, contacts of the double-pole microswitches D or U are closed. These control the direction of rotation of the aileron trim tab actuator motor in a manner similar to that for the rudder tab actuator described above.

Indication

13. For the principle of operation of the Desynn position indicators and transmitters, reference should be made to the appropriate Air Publication listed in Table 1.

SERVICING

General

14. General servicing of the electrical system is described in Group A.1. The standard serviceability tests which should be applied will be found in the appropriate Air Publications listed in Table 1. Apart from keeping all the components clean and carrying out the normal routine tests of security and serviceability, the only other servicing necessary is the actuator tests as described in para.15.

Tab actuator testing

15. The actuators should be tested periodically for correct functioning over their full travel and their range checked on the indicators, by operation of the trim switch. The actuators have permanent magnet field motors and it is recommended that only a pure d.c. supply is used, when testing. Rectified a.c. supply must not be used unless this has been checked as suitable, or the field of the actuators will be demagnetized.

Note . . .

The Type 37 rectifier (Ref.No.5P/2908) or the Westruk 609 and 829 are suitable for testing actuators with permanent magnet pole pieces.

16. Spare fin structures and port ailerons are supplied without actuators and these must have actuators assembled to them before they are fitted to aircraft. Before fitting a new fin or port aileron, it is recommended that the actuators are tested, as described in the appropriate Air Publications listed in Table 1. It is most important to ensure that the supply polarity is correct when testing, as incorrect connection or the use of a supply other than that specified will cause serious damage.

REMOVAL AND ASSEMBLY

General

17. Once access has been obtained, the removal and assembly of the actuators should present no unusual difficulties. Access to the rudder trim actuator may be gained by removing doors from the side of the upper fin structure. After removal of the aileron, access to the aileron tab actuator may be obtained by removing an access door from the upper surface of the aileron leading edge.

18. It must be noted that the operating rod from the aileron tab to the actuator, is removed with the actuator, and therefore must be disconnected from the tab operating lever before attempting to withdraw an actuator from the structure. The location of and access to all the components is described in Group A.3.